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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

TRAN, MINH LOAN

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/671,854	<b>Applicant(s)</b> BADER ET AL.	
	<b>Examiner</b> Minh-Loan T. Tran	<b>Art Unit</b> 2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 December 2005.  
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-45 is/are pending in the application.  
 4a) Of the above claim(s) 3-5, 12 and 24-45 is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 1, 6-11 and 13-23 is/are rejected.  
 7) ☒ Claim(s) 2 is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6-11, 19-23 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (6,531,719).

With regard to claim 1, figures 11 and 12 of Shibata et al. disclose a semiconductor chip 50 which emits electromagnetic radiation having an epitaxially produced semiconductor stack (16,17,18) based on nitride semiconductor material, which includes an n-GaN layer 16, a p-GaN layer 18, and an electromagnetic radiation generating region 17 which is arranged between these two semiconductor layers 16, 18; a base layer (15,11) on which the semiconductor stack (16, 17, 18) is arranged; and a TiN mirror layer 25 which is arranged between the semiconductor layer stack (16,17,18) and the base layer (15,11) and reflects electromagnetic radiation emitted by the semiconductor stack (16,17,18) in the direction of the base layer (15,11); wherein the mirror layer 25 has a plurality a planar reflection sub-surfaces which are positioned obliquely with respect to a main plane of the radiation-generating region 17 and each form an angle with respect to the main plane of the radiation-generating region 17.

Figures 11 and 12 of Shibata et al. do not clearly disclose each of the planar reflection sub-surfaces of the mirror 25 forms an angle of between 10° and 50° with respect to the main plane of the radiation-generating region 17. However, it would have

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been obvious to one of ordinary skill in the art to recognize that each planar reflection sub-surface of the mirror 25 of Shibata et al. forms an angle approximately of between 10° and 50° with respect to the main plane of the radiation-generating region 17, because the mirror 25 having inclined faces that is formed as a texture structure that shape like teeth of a saw in any sectional view, that is, a combination of a peak and trough is repeated through an inclined surface. The **peaks may include those which are independent of each other as polygonal pyramids (inclusive of cones)**. See lines 5-13 in column 2 of Shibata et al. Further, there is no evidence indicating the ranges of the angle of the planar reflection sub-surface of the mirror is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicants must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

With regard to claim 6, figure 11 of Shibata et al. shows the mirror 25 having the reflection sub-surfaces form pyramid-like structures.

With regard to claims 7-11, figure 11 of Shibata et al. does not show the mirror layer 25 having a plurality of different layers such as highly reflective layer, a protective layer and a joining layer. However, it would have been obvious to one of ordinary skill in the art to form the mirror layer of Shibata et al. having a plurality of different layers such

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as highly reflective layer, a protective layer and a joining layer in order to obtain a maximum efficiency of the emitted light.

With regard to claims 19 and 20, figure 11 of Shibata et al. shows the transparent electrode 19 is formed on the p-GaN layer 18, but it does not show the transparent electrode is formed on the n-type layer. However, it would have been obvious to one of ordinary skill in the art to replace the n-type layer 16 of Shibata et al. to the p-type layer, and the p-type layer 18 of Shibata et al. to the n-type layer because the n-type layer and the p-type layer can be interchanged. Note figures 8 and 17 of Hosoba et al. are cited to support for the well known position. Further, it would have been obvious to one of ordinary skill in the art to form the transparent electrode layer of Shibata et al. that is made of ITO or ZnO because such material is conventional in the art for forming the radiation-transmitting electrically conductive contact layer.

With regard to claim 21, Applicant's claim 21 does not distinguish over the Shibata et al. reference because figures 11 and 12 of Shibata et al. do not contain a growth substrate.

With regard to claim 22, lines 44-47 in column 4 of Shibata et al. disclose the p-type semiconductor layer is doped with magnesium (Mg).

With regard to claim 23, lines 25-32 in column 4 of Shibata et al. disclose the base (15,11) contains gallium arsenide.

Claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (6,531,719) in view of Shibata et al. (6,342,404).

With regard to claims 13 and 18, figures 1, 2, 11 of Shibata et al. ('719) do not show the semiconductor stack (16,17,18) includes at least one trench which defines a plurality of individual semiconductor layer elements. However, figures 1E, 2, 3, 6 of Shibata et al. ('404) shows the GaN semiconductor stack (26,27,28) includes at least one trench that is filled with an electrically insulating material 6 which transmits radiation generated by the radiation generating region 17; wherein the electrically insulating material 6 defines a plurality of individual semiconductor layer elements 5 (or 22). It would have been obvious to one of ordinary skill in the art to form the semiconductor stack (16,17,18) of Shibata et al. ('719) includes at least one trench which defines a plurality of individual semiconductor layer elements such as taught by Shibata et al. ('404) in order to simplify the processing steps of forming a plurality of light emitting devices.

With regard to claim 14, figures 1E, 2 and 3 of Shibata et al. ('404) show a plurality of trenches that are filled with electrically insulating material 6 extends in such a manner that the semiconductor layer elements 5 (or 22), in plan view, are in the shape of a quadrilateral.

With regard to claim 15, figure 11 of Shibata et al. ('719) does not show the semiconductor layer elements 50 each has a width which includes at most 10 pyramid-like structures at the mirror layer 25. However, although Shibata et al. ('719) does not teach exact the width of the semiconductor layer elements as that claimed by Applicant, the dimension differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It

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appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416, *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Circ. 1990).

With regard to claim 16, figure 6 of Shibata et al. ('404) shows the trenches that are filled with electrically insulating material 6 are at least sufficiently deep for them to isolate at least the radiation generating region 17.

With regard to claim 17, figures 1E and 6 of Shibata et al. ('404) do not disclose the width of the trenches that are filled with electrically insulating material 6 is at least double the depth of the trenches. However, it would have been obvious to one of ordinary skill in the art to form the width of the trenches Shibata et al.'s reference that are filled with electrically insulating material 6 is at least double the depth of the trenches, in order to ensure that the semiconductor layer elements 5 (or 22) are isolated.

### ***Response to Arguments***

2. Applicant's arguments filed 12/05/2005 have been fully considered but they are not persuasive.

It is argued, at page 15 of the remarks, that "It is of course well known that the "teeth of a saw" are commonly configured with a wide range of inclinations that extends far beyond applicant's claimed range 10 to 50 degrees; a literal reading of Shibata's express definition thus merely instructs the person of skill that the inclinations of the "texture structure" faces can be anywhere in the range  $0^{\circ} < x < 90^{\circ}$  ..... Shibata I presents no teaching or suggestion that planar reflection surfaces be obliquely oriented

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at an angle between 10 and 50 degrees, as is expressly recited in applicant's independent claim 1." However, figures 11 and 12 of Shibata et al. ('719) do show the mirror layer 25 has a plurality of planar reflection sub-surfaces, which are positioned obliquely with respect to a main plane of the radiation-generating region 17 and each form an angle with respect to the main plane of the radiation-generating region 17. The mirror 25 having a surface shape formed in accordance with the surface shape of the undercoat layer 15. The surface of the undercoat layer 15 is shaped like teeth of a saw in any sectional view, that is, a combination of a peak and trough is repeated through an inclined surface. **The peaks may include those which are independent of each other as polygonal pyramids (inclusive of cones)** or those which are standing in a row like a mountain range. See lines 5-13 in column 2, lines 4-23 in column 3 of Shibata et al. ('719). Note that the peaks 15 of Applicant's device also have a pyramid-like structure. Since the peaks of the reflection sub-surfaces of the mirror 25 of Shibata et al. ('719) having the same structure as that of the applicant's device, the reflection sub-surfaces of the mirror 25 of Shibata et al. ('719) form an angle with the range approximately of 10 to 50 degrees. Further, there is no evidence indicating the ranges of the angle of the planar reflection sub-surface of the mirror is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another



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variable recited in a claim, the Applicants must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It is argued, at page 16 of the remarks, that “Shibata I reference additionally fails to teach the provision of planar reflection surfaces as recited in applicant’s claim 1, since each and every one of the inclined surfaces shown in figure 9 appears to have varying inclinations and is therefore quite clearly not all planar.” However, figures 11 and 12 of Shibata et al. (‘719) do show the mirror layer 25 has a plurality of planar reflection sub-surfaces when the projected area ratio is 100%. See lines 31-37 in column 5 of Shibata et al.

It is argued, at page 18 of the remarks, that “Dependent claim 15 recites that the semiconductor layer elements each have a diameter or width that includes at most ten pyramid-like structure. Examiner states that Shibata I, figure 11 shows this but, in fact, the cited figures depict 18 saw teeth.” However, although Shibata et al. (‘719) does not teach exact the width of the semiconductor layer elements as that claimed by Applicant, the dimension differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416, *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Circ. 1990).

It is argued, at page 19 of the remarks, that “Claim 20 recites the use of at least one of ITO and ZnO as the contact layer ... Unless the examiner can cite a specific teaching for this substitutability, the section 103(a) rejection of claim 20 on this ground

should be withdrawn.” However, ITO and ZnO are conventional in the art for forming the transparent electrode in order to improve the ohmic contact and enhance the light efficiency of the light emitting device. Although Shibata et al. ('719) does not teach exact the material of the conductive contact layer as that claimed by Applicant, the material differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416, *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Circ. 1990).

It is argued, at page 19 of the remarks, that “ dependent claim 21 now recites that the semiconductor chip does not contain a growth substrate. Shibata I fails to teach or suggest this limitation either alone or in combination with Shibata II.” However, figures 11 and 12 of Shibata et al. ('719) do not have growth substrate. Thus, applicant's claim 21 does not distinguish over Shibata et al. ('719) reference.

### ***Allowable Subject Matter***

3. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Minh-Loan T. Tran whose telephone number is (571) 272-1922. The examiner can normally be reached on Monday-Friday 9:00 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mlt  
02/2006

  
Minh-Loan T. Tran  
Primary Examiner  
Art Unit 2826